Space Weather Forecast

Issued on Saturday 5 October 2024 at 13:35 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor/Moderate radio blackouts (R1/R2) expected throughout, chance of further Strong radio blackouts (R3). Minor/Moderate geomagnetic storms (G1/G2) expected, chance Strong (G3) over UTC weekend.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Activity has been at High levels during the period, owing to multiple low-level Moderate flares, peaking at 05/0844 UTC.

There are ten sunspot regions on the facing side of the Sun at present. The southwestern quadrant is particularly congested, with several large and complex regions. These groups and also the large region in the northeast disc broadly remained similar in appearance, but maintain significant magnetic complexity and pose a continued risk of notable solar flares. By comparison, the remaining regions are simpler and more stable, however, a region in the far southeast rotated into clearer view and contains a number of moderately sized intermediate spots between the main leading and trailing portions. Two small regions reached reached the far western disc and will soon rotate off the facing disc.

Two of the most complex sunspot regions have several small 'filaments' (arc of the Sun's material) strung through their constituent sunspots - something to monitor should any significant flares occur, potentially destabilising them to become Coronal Mass Ejections (CMEs). Some instability was observed in filaments in the south-central and far southwest quadrant into the UTC evening of 04 October, although no CMEs have been associated with these at the time of writing. Instead, the up to three CMEs seen heading southeast through the UTC day are thought to be associated with a narrowly far-sided southwestern activity to no effect at Earth. A northeast-heading event in the UTC evening was also thought far-sided.

No new Earth-directed CMEs were therefore in evidence.

Solar Wind / Geomagnetic Activity: The solar wind was indicative of a near background regime. Speeds were largely steady, varying between 340-440km/s (Slow to Slightly Elevated). The Interplanetary Magnetic Field (IMF) strength was broadly steady, varying between Weak and Moderate levels, with the important north-south component of the field erratic and not spending protracted periods anti-aligned with Earth's field (helping to limit geomagnetic activity).

Resultant Geomagnetic activity varied between Quiet and Unsettled levels (Kp1-3).

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Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is forecast to be Moderate to High, with occasional Moderate flares expected and a chance of isolated Strong flares, most likely from the largest regions in the southwest or northeast disc. Recurrence does not suggest any returning large regions over the eastern limb in the forecast period, and the major sunspot regions on the facing side are expected to be present throughout - the significant flare risk is therefore largely constant.

Solar Wind / Geomagnetic Activity: There are up to three CME arrivals in the period: firstly a possible glancing, but overdue blow from the Strong-class flare CME from 01 Oct on Day 1 (05 Oct). Secondly and more assuredly, the arrival of a CME from the 03 Oct Strong-class flare should arrive either late Day 1 or early Day 2 (05 or 06 Oct). A third possible glancing CME impact, resulting from an Moderate-class flare and filament eruption combination on 04 Oct has been added for late Day 3 (07 Oct).

A small, equatorial fast wind from a coronal hole may become geoeffective on Day 4 (08 Oct), but may be indistinguishable from the residual enhancements caused by the aforementioned CME arrivals that precede it. In either case, speeds for the high-speed stream are unlikely to exceed 500km/s.

G1-G2/Minor-Moderate Geomagnetic Storm (Kp 5-6) periods are Expected over the current UTC weekend, due to the potential arrivals of the 01 Oct CME (possible) and then the 03 Oct (expected). There may be a Chance of G3/Strong Geomagnetic Storm (Kp 7) conditions and even a Slight Chance of isolated G4 (Kp 8) intervals at peak. These larger-scale effects are perhaps most likely to straddle the intervening UTC night between Day 1-2 (05-06 Oct) and will rely on large, closely-spaced arrivals. Geomagnetic activity should then wane into the new UTC working week, with a further CMEs glance at best, while the fast wind component of the forecast is expected to be relatively minor in comparison.

Energetic Particles / Solar Radiation: There is a daily chance of solar radiation storms despite the lack of any recent enhancements, as two of the largest and most complex groups move through the most prone part of the solar disc in the period.

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Geomagnetic Storms

Geomagnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	80	80	60	20
Strong	G3	No	50	50	5	1
Severe	G4	No	20	20	1	1
Extreme	G5	No	5	5	1	1

Radio Blackouts - X-Ray Flares

X-Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 (M Class)	Yes	90	90	90	85
Very Active	R3-R5 (X Class)	No	30	30	30	25

Solar Radiation Storms (High Energy Protons)

Radiation Storms Probability (Exceedance)	Level ($cm^{-2}sr^{-1}s^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	25	25	25	25
Very Active	≥ S3 *	No	5	5	5	5
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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